

Amendments to the Claims:

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

Claims 1-11 (Cancelled)

1 **Claim 12 (Currently amended):** An acceleration sensor
2 for detecting an acceleration caused by an object
3 oscillated in an oscillation direction, comprising:

4 a sensor casing having a center axis and to be
5 positioned in coaxial alignment with said oscillation
6 direction to receive said acceleration, said sensor casing
7 including a cylindrical fixed case member having a
8 supporting portion axially extending, and a cover assembly
9 provided on said fixed case member to cover said fixed case
10 member to define a closed space;

11 an oscillation plate accommodated in said closed space
12 of said sensor casing and having a central portion
13 supported by said supporting portion of said fixed case
14 member, and a peripheral portion integrally formed with
15 said central portion and extending radially outwardly of
16 said central portion to be freely movable with respect to
17 said supporting portion of said fixed case member, said
18 oscillation plate being partly oscillatable along said
19 center axis with respect to said fixed case member;

20 a piezoelectric element held in contact with said
21 oscillation plate to generate a voltage indicative of said
22 acceleration when said acceleration is exerted on said
23 sensor casing to have said oscillation plate partly
24 oscillated along said center axis with respect to said
25 sensor casing with said peripheral portion of said

26 oscillation plate being deformed, said piezoelectric
27 element having first and second electrodes having said
28 voltage indicative of said acceleration to output
29 therethrough, and said oscillation plate and said
30 piezoelectric element being integrally oscillatable within
31 a range of effective oscillation frequencies; and

32 at least one terminal pin extending through said cover
33 assembly and terminating at an ~~the~~ exterior of said cover
34 assembly, said terminal pin electrically connected with one
35 of said electrodes;

36 whereby said oscillation plate and said piezoelectric
37 element are integrally oscillatable in two different modes
38 consisting of: a first oscillation mode where said
39 oscillation plate is irregularly deformed to have said
40 peripheral portion oscillated with a single vector in said
41 oscillation direction of said oscillation plate when said
42 oscillation plate is oscillated with respect to said fixed
43 case member at a resonance frequency f_0 ; and a second
44 oscillation mode where said oscillation plate is
45 irregularly deformed to have two different half parts of
46 said peripheral portion oscillated with ~~their~~ respective
47 different vectors opposite to each other in said
48 oscillation direction of said oscillation plate when said
49 oscillation plate is oscillated with respect to said fixed
50 case member at a noise frequency f_{01} , and said resonance
51 frequency f_0 and said noise frequency f_{01} are out of said
52 range of effective oscillation frequencies.

1 **Claim 13 (Currently amended):** An acceleration sensor
2 for detecting an acceleration as set forth in claim 12, in
3 which said supporting portion of said fixed case member has
4 a cylindrical section and a forward tapered section
5 integrally formed with said cylindrical section and in the
6 form of a truncated cone shape, said

7 forward tapered section having a top surface securely held
8 in contact with a surface ~~said second surface~~ of said
9 oscillation plate and having an outer end edge in axially
10 alignment with an ~~the~~ outer peripheral end of said
11 peripheral portion of said oscillation plate, said outer
12 end edge having a diameter ϕC_1 (mm), and said oscillation
13 plate having an effective oscillation radius R_1 (mm)
14 measured between ~~the~~ inner and outer ends of said
15 peripheral portion of said oscillation plate;

16 whereby said oscillation plate and said piezoelectric
17 element are integrally oscillatable in said first and
18 second oscillation modes ~~models~~ with ϕC_1 (mm) / R_1 (mm) and
19 f_{01} / f_0 given in the following equations.

20
$$\phi C_1 \text{ (mm)} / R_1 \text{ (mm)} \geq 0.92 \text{ and } f_{01} / f_0 \geq 0.52$$

1 **Claim 14 (Currently amended):** An acceleration sensor
2 for detecting an acceleration as set forth in claim 12 or
3 claim 13, in which said fixed case member and said
4 oscillation plate are each made of an electroconductive
5 material to ensure that ~~the remaining~~ one of said
6 electrodes is electrically connected with said oscillation
7 plate and said fixed case member.

1 **Claim 15 (Currently amended):** An acceleration sensor
2 for detecting an acceleration caused by an object
3 oscillated in an oscillation direction, comprising:

4 a sensor casing having a center axis and to be
5 positioned in coaxial alignment with said oscillation
6 direction to receive said acceleration, said sensor casing
7 including a cylindrical fixed case member having a
8 supporting portion axially extending, and a cover assembly
9 provided on said fixed case member to cover said fixed case
10 member to define a closed space;

11 an oscillation plate accommodated in said closed space

12 of said sensor casing and having a central portion
13 supported by said supporting portion of said fixed case
14 member, and a peripheral portion integrally formed with
15 said central portion and extending radially outwardly of
16 said central portion to be freely movable with respect to
17 said supporting portion of said fixed case member, said
18 oscillation plate being partly oscillatable along said
19 center axis with respect to said fixed case member, said
20 oscillation plate having a first flat surface opposing and
21 spaced apart along said center axis with respect to said
22 fixed case member, and a second flat surface opposing and
23 spaced apart along said center axis with respect to said
24 cover assembly of said sensor casing;

25 a first piezoelectric element having a first surface
26 and a second surface, said first surface of said first
27 piezoelectric element held in contact with said second flat
28 surface of said oscillation plate to generate a voltage
29 indicative of said acceleration when said acceleration is
30 exerted on said sensor casing to have said oscillation
31 plate partly oscillated along said center axis with respect
32 to said sensor casing with said peripheral portion of said
33 oscillation plate being deformed;

34 a second piezoelectric element having a first surface
35 and a second surface, said first surface of said second
36 piezoelectric element held in contact with said first flat
37 surface of said oscillation plate to generate a voltage
38 indicative of said acceleration when said acceleration is
39 exerted on said sensor casing to have said oscillation
40 plate partly oscillated along said center axis with respect
41 to said sensor casing with said peripheral portion of said
42 oscillation plate being deformed, said first and second
43 piezoelectric elements each having a plurality of
44 electrodes having said voltage indicative of said
45 acceleration to output therethrough, said electrodes

46 including a first electrode provided on said second surface
47 of said first piezoelectric element, and a second electrode
48 provided on said second surface of said second
49 piezoelectric element, ~~and a second electrode provided on~~
50 ~~said second surface of said second piezoelectric element,~~
51 and said oscillation plate and said first and second
52 piezoelectric elements being integrally oscillatable within
53 a range of effective oscillation frequencies; and

54 at least one terminal pin extending through said cover
55 assembly and terminating at an ~~the~~ exterior of said cover
56 assembly, said terminal pin electrically connected with
57 said first and second electrodes;

58 whereby said oscillation plate and said first and
59 second piezoelectric elements are integrally oscillatable
60 in two different modes consisting of: a first oscillation
61 mode where said oscillation plate is irregularly deformed
62 to have said peripheral portion oscillated with a single
63 vector in said oscillation direction of said oscillation
64 plate when said oscillation plate is oscillated with
65 respect to said fixed case member at a resonance frequency
66 f_0 ; and a second oscillation mode where said oscillation
67 plate is irregularly deformed to have two different half
68 parts of said peripheral portion oscillated with ~~their~~
69 respective different vectors opposite to each other in said
70 oscillation direction of said oscillation plate when said
71 oscillation plate is oscillated with respect to said fixed
72 case member at a noise frequency f_{01} , and said resonance
73 frequency f_0 and said noise frequency f_{01} are out of said
74 range of effective oscillation frequencies.

1 **Claim 16 (Currently amended):** An acceleration sensor
2 for detecting an acceleration as set forth in claim 15, in
3 which said supporting portion of said fixed case member has
4 a cylindrical section and a forward tapered section

5 integrally formed with said cylindrical section and in the
6 form of a truncated cone shape, said
7 forward tapered section having a top surface securely held
8 in contact with said second surface of said oscillation
9 plate and having an outer end edge in axially alignment
10 with ~~an~~ the outer peripheral end of said peripheral portion
11 of said oscillation plate, said outer end edge having a
12 diameter ϕC_1 (mm), and said oscillation plate having an
13 effective oscillation radius R_1 (mm) measured between the
14 inner and outer ends of said peripheral portion of said
15 oscillation plate;

16 whereby said oscillation plate and said first and
17 second piezoelectric element are integrally oscillatable in
18 said first and second oscillation modes with ϕC_1 (mm) / R_1
19 (mm) and f_{01} / f_0 given in the following equations.

20 ϕC_1 (mm) / R_1 (mm) ≥ 0.92 and $f_{01} / f_0 \geq 0.52$

1 **Claim 17 (Currently amended):** An acceleration sensor
2 for detecting an acceleration as set forth in any one of
3 claims 15 and 16, ~~further comprising in which said first~~
4 ~~piezoelectric element having~~ a third electrode provided on
5 said first surface of said first piezoelectric element, and
6 ~~second piezoelectric element having~~ a fourth electrode
7 provided on said ~~first~~ second surface of said ~~second~~ first
8 piezoelectric element, and said fixed case member and said
9 oscillation plate are each made of an electroconductive
10 material and to ensure that said third electrode of first
11 piezoelectric element and said fourth electrode of said
12 second piezoelectric element are electrically connected
13 with said oscillation plate and said fixed case member.